REMARKS

The present invention is a method of real-time estimation of a flow mode, at all points of a pipe whose structure can be defined by structural parameters, of a multiphase fluid stream defined by physical quantities in comprising at least a liquid phase and at least a gas phase and a system providing real-time estimation of a flow mode, at all points of a pipe whose structure can be defined by structural parameters of a multiphase fluid stream defined by physical quantities and comprising at least a liquid phase and at least a gas phase. A method of real-time estimation of a flow mode, at all points of a pipe whose structure can be defined by structural parameters, of a multiphase fluid stream defined by physical quantities and comprising at least a liquid phase and a gas phase in accordance with the invention includes forming a nonlinear neural network as illustrated in Fig. 1 with an input layer having as many inputs as there are structural parameters and physical quantities, an output layer with as many outputs as there are quantities necessary for estimation of the flow mode and at least one intermediate layer; creating a learning base with predetermined tables connecting values obtained from the output data to corresponding values of the input data as illustrated in Fig. 1; determining by interations weighing factors of activation function allowing connection of the values in input and output data tables; determining at least a velocity difference between gas and liquid and a stratified flow fraction with the neural network defined by the weighting factor; and estimating the flow mode from at least the velocity difference and the stratified flow fraction. See sections 2) Input and output data... for) learning: Principle and Implementation in the Example in the Substitute Specification.

Claims 1, 2, 3, 6, 7 and 8 stand rejected under 35 U.S.C. § 103 as being unpatentable over United States Patent 5,741,980 (Hill, et al.) these grounds of rejection are traversed for the following reasons.

Each of the independent claims 1 and 6 respectively substantively recites forming a non-linear neural network with an input layer having as many inputs as there are structural parameters and physical quantities, an output layer with as many outputs as they are quantities necessary for estimation of the flow mode and at least one intermediate layer; creating a learning base with predetermined tables connecting values obtained from the output data to corresponding values of the input data; determining by interations weighting factors of activation function allowing connection of the values in input and output tables; determining at least a velocity difference between gas and liquid and a stratified flow fraction with the neural network defined by the weighting factor; and estimating the flow mode from at least the velocity difference and the stratified flow function. This subject matter has no counterpart in Hill.

In the first place it is submitted that the recitation of the independent claims of a real-time estimation of a flow mode is different than the function of Hill, et al. Hill, et al. discloses a flow analysis system and method which uses sensors and communication with a conduit which has flow therein and utilizes a trained neural network which receives flow indicator quantities as input and outputs flow rate and gas flow rate of a two-face flow in a conduit. See column 7, lines 50-67. This subject matter does not render obvious independent claims 1 and 7. It is submitted that a person of ordinary skill in the art would not consider Hill's teachings of using a

trained neural network which receives flow indicator quantities as inputs and outputs flow rate of liquid and gas to meet the mode limitation.

Moreover, it is submitted that there is no disclosure of the claimed determination of at least a velocity difference between gas and liquid and a stratified flow fraction with a neural network defined by the weighting factor; and estimating the flow mode for at least the velocity difference and the stratified flow fraction. A person of ordinary skill in the art would not be motivated to modify the teachings of Hill, et al. to arrive at the subject matter of the independent claims including the above limitation except by impermissible hindsight.

Claims 2 and 7 further limit claims 1 and 6 in reciting analyzing the output data of the neural network to allow sorting, among the values of the output data of the neural network, only data to be taken into account in the iterative determination of weighting coefficients of the activation function. It is submitted that this subject matter is not taught by Hill, et al. The Examiner's reliance upon column 28, lines 43-50 as teaching filtering raw data for obtaining appropriate information to be input to the neural network for processing as meeting the sorting limitations in claims 1 and 7 is erroneous. The subject matter of column 28, lines 43-50 pertains to the choice of output data according to the input data which are flow indicators quantities which do not meet the sorting limitation of claims 2 and 7.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of either by telephone discussion or by personal interview, the

Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus, LLP Deposit Account No. 01-2135 (Docket No. 612.40260X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

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